

Food & nutrition security: Challenges in the new millennium

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The World Food Summit in 1996 provided a comprehensive definition for food security which brings into focus the linkage between food, nutrition and health. India has been self sufficient in food production since seventies and low household hunger rates. India compares well with developing countries with similar health profile in terms of infant mortality rate (IMR) and under five mortality rate (U5 MR). India fares poorly when underweight in under five children is used as an indicator for food insecurity with rates comparable to that of Sub-Saharan Africa. If wasting [low body mass index (BMI) for age in children and low BMI in adults] which is closely related to adequacy of current food intake is used as an indicator for the assessment of household food security, India fares better. The nineties witnessed the emergence of dual nutrition burden with persistent inadequate dietary intake and undernutrition on one side and low physical activity / food intake above requirements and overnutrition on the other side. Body size and physical activity levels are two major determinants of human nutrient requirements. The revised recommended dietary allowances (RDA) for Indians takes cognisance of the current body weight and physical activity while computing the energy and nutrient requirements. As both under- and overnutrition are associated with health hazards, perhaps time has come for use of normal BMI as an indicator for food security.

Key words Food insecurity outcome indicators - food security - hunger - nutrition security - under five mortality - undernutrition

Introduction

India with 2.5 per cent of the global land mass and 16 per cent of the global population¹ recognized the importance of human resources as the engines powering national development and gave high priority to improvement of the health and nutritional status of the population. Article 47 of the Constitution of India¹ states that, “the State shall regard raising the level of nutrition and standard of living of its people and improvement in public health among its primary duties”. India’s Five-Year Plans enunciated the policies, laid down multi-pronged strategies, outlined multi-sectoral programmes to improve food security

and nutritional status of the population, laid the goals to be achieved in a specified time frame, and provided the needed funds to implement the interventions.

As a result of all these interventions, famines and severe food insecurity are no longer a threat but even today seasonal food insecurity is seen in different pockets of the country. There has been a substantial reduction in severe grades of undernutrition and micronutrient deficiencies and some improvement in the nutritional status of all the segments of population. However, in the last five decades the rate of decline in undernutrition has been slow; the mortality rate has come down by 50 per cent and the fertility rate by 40

per cent but the reduction in underweight rates is only 20 per cent¹.

The last two decades have witnessed rapid economic growth, increasing mechanization of the transport, work and household activity domains and consequent steep reduction in physical activity in all segments of population. Reduced physical activity and unaltered dietary intake have led to the increasing prevalence of obesity and associated non-communicable diseases. In affluent segments of population inappropriate dietary choices and increasing sedentary life-style have aggravated the problem. Henceforth the country has to gear itself up to prevent and combat the dual burden of undernutrition and overnutrition and associated health problems².

India has been in the forefront in developing national food and nutrition databases, undertaking research studies and surveys documenting the ongoing agriculture, food, nutrition and health transitions. Indian scientists have contributed substantially to the global efforts to review the ongoing transitions and evolve appropriate definition of food security, recommendations regarding human nutrient requirements, and develop appropriate standards for assessment of nutritional status. The country has also utilized the evolving knowledge and invested in evidence based intervention programmes to (i) improve food and nutrition security of the citizens, (ii) ensure that the ongoing food supplementation programmes provide sufficient food to meet the energy/ nutrients gap in vulnerable segments of population, and (iii) nationalize and improve ongoing nutrition interventions aimed at prevention, early detection and effective management of under- and overnutrition. The present manuscript will briefly review these efforts.

Food security

The term “food security” was first used in the international development literature of the 1960s and 1970s, and referred to the ability of a country or region to assure adequate food supply for its current and projected population. During this era, Malthusian theory that if the population growth exceeded the growth in food production, there will be disastrous consequences, was widely accepted³. The focus of international and national efforts was to grow more food and reduce population growth rates to sustainable levels. Food security was measured by food grain production to ward off famine, improving availability and access to food at affordable cost, to meet the energy

requirements and prevent chronic undernutrition among the ever growing population.

Over decades, there has been increasing recognition that though there has been reduction in severe acute food insecurity, dietary intake in large segments of population does not meet energy (hunger) and micronutrient (hidden hunger) requirements and consequently under-nutrition and micronutrient deficiencies are widespread. Falling physical activity and unaltered food intake beyond requirements lead to overnutrition, and are associated with adverse health consequences. Taking these into account the World Food Summit in 1996 re-defined food security as a situation in which “all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life”⁴. This definition encompasses whole lot of pre-requisites for food security and brings into focus the linkage between food, nutrition and health. The revised definition has been accepted by all the member countries and many countries refer to this comprehensive definition as food and nutrition security.

India's quest for food security

In 1950s India the second most populous country in the world, was not self sufficient in food grain production and had to import wheat. The continued high fertility [birth rate of 40.8 and total fertility rate (TFR) of 6] and relatively lower mortality [crude death rate (CDR) of 25.1] resulted in high population growth rate and consequent increase in projected food requirement¹. Review of the food security and nutrition situation in the new millennium showed that the country had been self sufficient in food grain production for four decades and the threat of famine has been eliminated. Food insecurity, mostly seasonal, was confined to poorer segments in remote areas; hunger had been reduced and energy needs met by food grains. But pulses critical to meet protein needs in populations subsisting on vegetarian diets, were expensive and consumption had come down. Vegetables intake which is essential to provide the needed micronutrients continued to be low. Low dietary intake is the major factor responsible for undernutrition but nutrient loss associated with infections comes a close second. Potable water supply and sanitation are critical for prevention of infections. Health care for early detection and effective management of infections can reduce undernutrition due to infections.

The Tenth Five Year Plan focused on comprehensive interventions aimed at improving food and

nutrition security. The Tenth Plan envisaged that there will be a paradigm shift from (i) household food security and freedom from hunger to nutrition security for the family and the individual; (ii) untargeted food supplementation to screening of all the persons from vulnerable groups, identification of those with various grades of undernutrition and appropriate management; and (iii) lack of focused interventions on the prevention of overnutrition to the promotion of appropriate lifestyles and dietary intakes for the prevention and management of over-nutrition and obesity.

Food production

Due to the multisectoral initiatives taken during the green revolution (Box), India achieved self sufficiency in food production to meet the needs of the growing population, and built up adequate buffer stocks within a decade². In retrospect the green revolution can be termed as successful mission mode (self sufficiency in food production), public (initiatives by government) private (land was farmer's private property) partnership to achieve self-sufficiency in food grain production. It remains to be one of the best examples of what could be achieved if agriculture scientists, economists and nutrition scientists pull together.

In subsequent decades growth in food grain production stayed ahead of population growth and India became self sufficient in food production. Under the National Food Security Mission⁵ efforts are underway to ensure that inspite of growing population, constraints of land, water, low productivity and high input costs, India remains self sufficient in food production and overcomes seasonal food insecurity in pockets even among vulnerable segments.

Challenges in food production

There is growing recognition that monocropping with cereals has adverse impact on soil nutrition. Agricultural scientists and nutritionists in India joined hands in the advocacy nutrition orientation of food production policies for sustaining an ever green revolution which will maintain both soil and human

nutrition and health². Mere self sufficiency in food grain production cannot result in steep reduction in undernutrition rates or micronutrient deficiencies in the country because population needs adequate quantities of balanced diet to remain well nourished and healthy. Pulses are the major source of protein in Indian diets. Reduction in pulse consumption will have adverse effect on nutrient intake and nutritional status of the population. Pulse production does not require much water, and is not so labour intensive. Growing pulses enriches soil. Pulses command reasonable price. In spite of all these favourable factors, pulse production has been stagnant for the last five decades. Gap between demand and supply necessitated import of pulses. The cost of pulses soared². In spite of continued expenditure on pulses, there was reduction in household pulse consumption. The pulse component of food security mission has introduced on farm inputs, price support and procurement policies for pulses. These have resulted in increase in pulse production to 15 million tonnes in 2011⁶; it is projected that pulse production will reach 17 million in the next two years and pulse gap could be eliminated in the foreseeable future.

India is at the top in vegetable and fruit production in the world, but vegetable intake of Indians remains low; consequently prevalence of anaemia and vitamin A deficiency continue to be high². India's Horticultural Mission⁷ is expected to focus on production, processing and marketing of low cost, nutrient rich vegetables so that these are available throughout the year at an affordable cost to urban and rural population. If this is achieved, nutrition education for increase in vegetable consumption will succeed in increasing vegetable intake and there will be reduction in micronutrient deficiencies.

Prevention and management of infections

Health professionals have been concerned about the loss of nutrients during illness and stress on the importance of safe drinking water and environmental sanitation in preventing infections. National Rural Health Mission⁸ aims at convergence between water, sanitation, education, nutrition and health programmes (Figure). The country is trying to implement comprehensive programmes to ensure improvement in nutrition security, nutrition and health status of the population.

Food insecurity outcomes

World Food Summit in 1996⁴ redefined the term food security and brought into focus the linkage between food, nutrition and health. It is, therefore, logical that

Box. Government initiatives to achieve requisite food production

- (i) Investment in irrigation
- (ii) Fertilizer production and subsidy
- (iii) Land reforms
- (iv) R&D support for development of high yielding strains
- (v) Laboratory-to-land extension education
- (vi) Farm level procurement at minimum support price

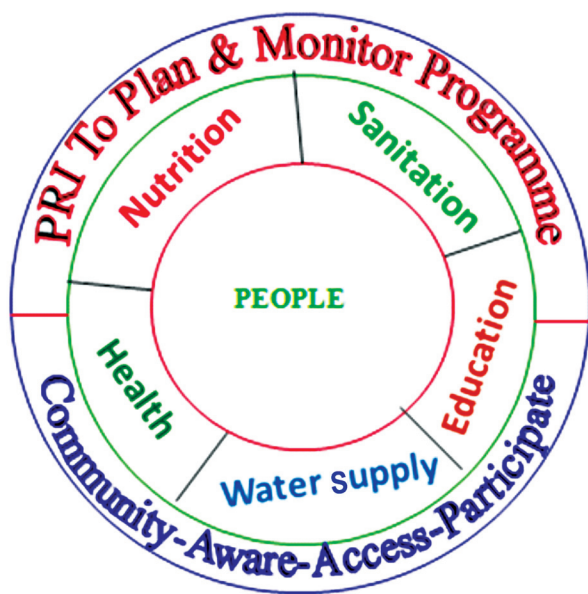


Fig. Convergence of services under National Rural Health Mission (NRHM). PRI, Panchayati Raj Institutions.

the indicators for assessment of food insecurity should reflect these three dimensions. The Food and Agriculture Organization of the UN (FAO)⁹ has advocated use of food grain availability, hunger and some well defined health and nutrition indicators as 'Food Insecurity Outcome' indicators and this approach has been accepted and followed by member countries. Use of this framework to compare food insecurity in India with global data brought out some interesting paradoxes with respect to India.

Globally and nationally, there is a direct relationship between food availability, affordable access to food and hunger. Assessment of food production and proportion of hungry population is relatively an easy measure and has been regularly reported by most countries; these reports are compiled by FAO and presented as hunger maps. India has been self sufficient in food production since seventies and has built up adequate buffer stocks. From the national food grain availability perspective India has done well in ensuring food security of its citizens¹⁰.

Food grains are being procured at cost fixed by the Government of India and this mechanism has kept the food grain prices at a relatively low level until three years ago. Poor segments of population access food grains at subsidised cost through public distribution system. As a result of these interventions hunger rates (defined as not having two square meals a day) in India

are relatively low. India's global position regarding food insecurity as assessed by the hunger rates is comparable to other developing countries¹⁰.

The health indicators used as food insecurity outcome indicators are infant and under five mortality. Birth weight, infant and young child feeding practices, availability, access and utilization of health services are the major determinants of infant and under five mortality. The relationship between infant and young child feeding (IYCF) and household food security is not direct or strong except under conditions of severe deprivation. India's global position in relation to infant mortality rate (IMR) and under five mortality rate (U5 MR) are comparable to similar developing countries¹¹.

The nutrition indicators for assessment of food insecurity are low BMI among adults and under five underweight rates. The relationship between these indicators and food security is complex. There are persuasive evidences to suggest that there are substantial differences between countries in BMI of adults depending upon the rate of ongoing nutrition transition¹². Underweight rate in preschool children is the most widely used nutrition indicator for assessment of food insecurity. Over 40 per cent of preschool children in India are underweight¹¹. By this indicator India is rated very poor in terms of food security, close to Sub saharan Africa. Available evidence suggests that in countries with high stunting rates, under five underweight rates are not directly linked to household food security and are not good indicators of food insecurity¹³.

Revision of recommended dietary allowances (RDA) for Indians

Recommended dietary allowances form the basis of several important interventions to improve the nutrition security, including efforts to maintain national self sufficiency in food production, poverty line computations, interventions for improving the food and nutrition security of people living below the poverty line and food supplementation programmes aimed at bridging the gaps between dietary intake and requirements of the vulnerable segments of the population. Over the past two decades, newer technologies have emerged, which enable more precise estimation of the nutrient requirements. Changes in lifestyles have resulted in alteration in energy requirements. Taking all these into account,

the FAO/WHO/UNU expert committee revised their recommendations on Human Nutrient Requirements in 2004¹⁴. The Expert Committee of the Indian Council of Medical Research (ICMR)¹⁵ has revised the RDA for Indians in 2010.

The ICMR recommendations take into account the fact that body weight and physical activity are major determinants of energy requirement. Similarly the Expert Committee has provided recommendations for energy requirements for reference for the reference man (60 kg, moderately active) and reference woman (55 kg, moderately active), and children (+2SD of the NNMB weight for age) (Table I). In addition, they have computed energy requirements per kilogram, so that the energy requirement and energy intake can be computed on the basis of current stature and weight. This is an important contribution, because the country has entered the dual nutrition burden era and neither low nor high energy intake is desirable.

Revised RDA, poverty and food security

In the seventies, income was one of the major determinants of food security; over 70 per cent of households were food insecure, in spite of household

expenditure on food being over 70 per cent, 70 per cent children were undernourished². All-India rural and urban poverty line baskets (PLB) were derived for rural and urban areas separately, anchored in the per capita calorie norms of 2400 (rural) and 2100 (urban) per day¹⁶. The existing all-India rural and urban official poverty lines were originally defined in terms of per capita total consumer expenditure (PCTE) at 1973-1974 market prices and adjusted over time and across States for changes in prices. However, the consumption patterns underlying the rural and urban PLBs remained tied down to those observed more than three decades ago¹⁶. Alterations in income, lifestyles and consumption expenditure pattern have occurred in all segments including the poor. Consumption expenditure on food has decreased and expenditure on other items such as transport, education and health care has increased. The earlier poverty lines assumed that basic social services of health and education would be supplied by the State and hence, although private expenditure on education and health was covered in the base year 1973-1974, no account was taken of either the increase in the proportion of these in total expenditure over time or of their proper representation in available price indices.

Planning Commission constituted an expert group to review the methodology for estimation of poverty under the chairmanship of Dr Tendulkar which submitted its report in November 2009. This committee¹⁷ had recommended that actual private expenditure per capita on food, education and health consistent with optimal nutritional, educational and health outcomes should be used to define poverty line. The new definition of poverty is broader in scope and fits well with the current definition of food and nutrition security. Using the new poverty line definition, the people near the poverty line in urban areas continue to be able to afford the original calorie norm of 2100 per capita per day, but their actual observed calorie intake from 61st Round of National Sample Survey Organization (NSSO) is 1776 calories per capita¹⁷. This actual intake is very close to the revised calorie intake norm of 1770 per capita per day currently recommended by the FAO, World Health Organization (WHO) and United Nations University¹⁴. Actual observed calorie intake of those near the new poverty line in rural areas (1999 calories per capita) is higher than the FAO norm. If these revised criteria are applied, poverty at all India level in 1993-1994 was 50.1 per cent in rural areas, 31.8 per cent in urban areas and 45.3 per cent in the

Table I. Recommended dietary allowance (RDI) for Indians

| Group | Reference weight (kg) | RDA for ref wt person (Kcal/day) | Actual intake (Kcal/day) | Gap |
|----------------|-----------------------|----------------------------------|--------------------------|------|
| Adult man | 60 | 2730 | 2000 | 730 |
| Adult woman | 55 | 2230 | 1738 | 492 |
| Pregnant | | 350 more | 1726 | 854 |
| lactating | | 500 more | 1878 | 852 |
| 1 - 3 yr | 12.9 | 1060 | 714 | 346 |
| 4 - 6 yr | 18 | 1330 | 978 | 352 |
| 7 - 9 yr | 25.1 | 1690 | 1230 | 460 |
| Boys | | | | |
| 10 - 12 yr | 34.3 | 2190 | 1473 | 717 |
| 13 - 15 yr | 47.6 | 2750 | 1645 | 1105 |
| 16 - 17 yr | 55.4 | 3020 | 1913 | 1107 |
| Girls | | | | |
| 10 - 12 yr | 35 | 2010 | 1384 | 626 |
| 13 - 15 yr | 46.6 | 2330 | 1566 | 764 |
| 16 - 17 yr | 52.1 | 2440 | 1630 | 810 |
| Infants | | | | |
| 0-6 m | 5.4 | 497 | | |
| 6 - 12 m | 8.4 | 672 | | |

country as a whole as compared to the 1993-1994 official estimates of 37.2 per cent rural, 32.6 per cent urban and 36.0 per cent combined¹⁷.

Revised RDA and foods supplementation programmes

Pregnant and lactating women and children especially preschool children have long been recognised as being nutritionally vulnerable segments of population. Food supplementation programmes under Integrated Child Development Services (ICDS) and Mid-day Meal (MDM) are designed to bridge this gap. RDA for different age and physiological groups have been computed on the basis of average of the 95th centile weights of the age categories 18-19, 20-24 and 25-29 yr obtained from National Nutrition Monitoring Bureau (NNMB) and India Nutrition Programme (INP) surveys¹⁵. Reference body weight for boys and girls were computed from the 95th centile values of body weights of rural India from NNMB and INP surveys. For infants and young children the data from Multicentre Growth Reference Standards (MGRS) which correspond broadly to the 95th centile of the weight of Indian rural children, were used. The gap between actual intake (NNMB)¹⁸ and requirements for the persons with reference body weight for various age and physiological groups is given in Table I. As expected the gap was highest among pregnant and lactating women. The next highest gap was seen among adolescent boys and girls. The gap was relatively lower in preschool and under ten children (Table I).

As Indians of all age groups weigh far less than the reference population used for deriving the RDA, the ICMR expert group also computed the RDA per kg body weight. Computed gap between requirements and actual intake of energy for various age groups computed on the basis of actual weight is shown in Table II. Even by this computation the gap between the requirements and the intake is highest among pregnant and lactating women and in adolescent girls and boys. Bridging the gap in pregnant and lactating women is of paramount importance as this would benefit both the mother and the child. Adolescence is the period of rapid physical growth; providing adequate energy intake may enable them to attain their optimal growth during this period. Viewed in this context the initiation of the MDM for the upper primary school children is an appropriate step. It might be logical to extend MDM to the secondary school also.

Table II. Computed energy requirements for actual current weight in different groups

| Group | Actual mean ^{18,21} weight (kg) (NNMB) | Requirement for actual wt (Kcal/day) | Actual intake (Kcal/day) | Gap |
|-------------|---|--------------------------------------|--------------------------|------|
| Adult man | 51 | 2346 | 2000 | -346 |
| Adult woman | 46 | 1886 | 1738 | -148 |
| Pregnant | | 2236 | 1726 | -510 |
| Lactating | | 2386 | 1878 | -518 |
| Children | | | | |
| 1 - 3 yr | 10.5 | 840 | 714 | -126 |
| 4 - 6 yr | 14.6 | 1095 | 978 | -117 |
| 7 - 9 yr | 19.7 | 1379 | 1230 | -149 |
| Boys | | | | |
| 10 - 12 yr | 26.6 | 1729 | 1473 | -256 |
| 13 - 15 yr | 36.8 | 2208 | 1645 | -563 |
| 16 - 17 yr | 45.7 | 2514 | 1913 | -601 |
| Girls | | | | |
| 10 - 12 yr | 26.7 | 1469 | 1384 | -85 |
| 13 - 15 yr | 36.9 | 2030 | 1566 | -464 |
| 16 - 17 yr | 42.6 | 2130 | 1630 | -500 |

Food supplementation programmes: ICDS

Under the ICDS programme the guidelines envisage that children in the 6-72 month age group should get 500 Kcal and pregnant and lactating women should get 600 Kcal as supplements¹⁹. The supplements provided for preschool children are much higher than the gap between the requirement and actual intake; the supplements provided to pregnant and lactating women are adequate to bridge the gap. Taking into account the problem that 6-36 month old infants and pregnant and lactating women will not be able to come to the *anganwadi* every day, ICDS guidelines envisage that they should be provided with weekly take home rations (THR). Given the situation especially in food insecure homes some of the THR are likely to be shared with other members of the family. The 36-72 month old children have small stomach capacity and cannot consume 500 Kcal in one meal.

The guidelines envisage that these children should come to *anganwadi* for preschool education and be given a snack in the morning and a hot cooked meal at noon. It is possible that in many households the ICDS supplements under *anganwadi* feeding become the substitute for home food. Data from National Family Health Survey-3 (NFHS-3)²⁰ indicate that between States there are large variations in coverage under the ICDS food supplementation programme. It is a matter of concern that the coverage is low in some populous States with high poverty and undernutrition rates. Data from NNMB²¹ surveys indicate that the population is aware of the usefulness of food supplements in improving food security of the target individuals and their households and access these in times of food insecurity such as drought.

ICDS envisages provision of 800 Kcal / day to undernourished children. If this provision is effectively used to provide additional food to the needy undernourished children regularly for a period of 2-3 months, it should be possible to achieve significant improvement in their nutritional status. However, the data from NFHS-3²⁰ have shown that the coverage under weighing is low in most States and because children are not weighed undernutrition goes undetected. During the Village Health and Nutrition Days it should be possible to weigh all the children at least once in three months and plot the growth in the Mother Child Protection Card. If this were done, it would be possible to ensure early detection of growth faltering and provide appropriate health and nutrition education and interventions so that these children do not become moderately undernourished. For children detected with moderate undernutrition additional supplements should be provided regularly until they regain weight. If this were done, it would bring about some reduction in undernutrition rates in under five children.

Mid-day meal (MDM) programmes

Under MDM primary school children get about 500 Kcal/per day and the upper primary school children get 750 Kcal/per day²². The quantum of the energy currently being provided would appear to be adequate to bridge the gap (Table II). However, it is essential to ensure that the MDM does not become the substitute for home food. Under school health programmes most children do get weighed once a year but there has not been any effort to measure height, compute BMI in children and identify those who are undernourished.

School health programme can use the WHO 2007 standards for growth²³ and identify children with low BMI, look for health problems in them and treat those with infection. The school teachers could provide nutrition education and try to provide an additional helping form MDM to wasted children especially those coming from food insecure households. With these interventions, it might be possible to achieve substantial improvement in health and nutritional status of school children within the existing investments.

Usefulness of low BMI in adults and underweight in under five as indicators of food insecurity

Anthropometric assessment is one of the most widely used methods for assessment of nutritional status both at the community level and for the individuals because of the relative ease and reproducibility of measurements, availability of standards based on normal population for comparison and demonstrated association between abnormal measurements and clinical illnesses. Height is influenced by genetic and environmental factors including dietary intake and stunting reflects the cumulative impact of past undernutrition. Weight is the index which reflects partly the cumulative impact of past undernutrition (stunting is associated with lower body weight) and partly current nutritional status (low BMI for the current height is associated with lower body weight). Low BMI reflects current undernutrition.

Low BMI in adults

It is well recognised that there are large differences in stature and consequently in body weights of adults between countries and even between different regions in large countries. Research studies mostly from developed countries had shown that BMI < 18.5 kg/m² is associated with low dietary intake and, therefore, has been accepted as the indicator for food insecurity⁹. Low BMI is associated with functional changes such as reduced work capacity for manual work and increased susceptibility to infection. Apart from low dietary intake chronic infections such as HIV and tuberculosis in adults and repeated episodes of acute infection in children are associated with wasting. Data from NNMB surveys²¹ (using BMI for as indicator for assessment of nutritional status in adults) have shown that between the 1970s and the 1990s there was a slow but steady decline in undernutrition in both men and women. Improved household food security due to poverty

reduction and access to subsidised food grains through Public Distribution System (PDS) might account for this improvement. By and large low BMI in adults still reflects low dietary intake and hence continues to be used as one of the indicators of household food in security.

Underweight rates in under five children

Traditionally preschool children have been considered as one of the most vulnerable segments for undernutrition. Underweight rates in under fives have been widely used as one of the indicators of food insecurity. Even today, over 40 per cent of preschool children in India are underweight²⁰. The economists and policy makers in India have been concerned by the fact that underweight rates in preschool children in India are comparable to Sub-Saharan Africa^{12,13}, inspite of the fact that India (i) is the second fastest growing economy, (ii) has been self sufficient in food production for four decades, (iii) has relatively low poverty and hunger rates, (iv) has very large ongoing food supplementation programmes for preschool and school children, and (v) coverage under health service are improving and under five mortality rate is relatively low.

Over the last two decades there has been a growing evidence that underweight rates in preschool children may not be an appropriate indicator for assessment of food insecurity in the South Asian countries with high stunting rates¹³. Indian paediatricians have documented that mature but low birth weight neonates survive with essential newborn care, but they have a substantially lower growth trajectory²⁴. In India, the shorter preschool children weigh less and are misclassified as undernourished even though their weight is appropriate for their height; short underweight Indian children can even be overnourished (have high BMI)²⁵. Poor IYCF has been shown to be a major factor responsible for the steep increase in underweight rates between 6-23 months of age²⁶. IYCF is governed by the knowledge attitude and practices of the family and is not directly related to household food security. Wasting in children and adults has been linked clearly to acute food insecurity seen in drought, war and other calamities. The usefulness of BMI for age in children as an indicator of chronic food insecurity has not yet been widely explored. However, available data suggest both low BMI in children and low BMI in adults are good indicators of under-nutrition; if both are found in the same family it suggest family is food insecure.

In 2006, the WHO provided the standards for weight for age, height for age and BMI for age for preschool children derived from growth patterns of breast fed infants²⁷. WHO advocates increasing use of BMI for age for assessment of both under- and overnutrition in children²⁷. The Government of India has accepted the use of WHO standards for assessment of nutritional status in children. Analysis of data from NFHS-3 using WHO 2006 standards has shown that while 48 per cent of under five children were stunted and 42.5 per cent of children were underweight, only 16.9 per cent had low BMI for age²⁰. About a third of Indian neonates are wasted (had BMI <-2SD) at birth and are likely to follow a low trajectory for BMI through infancy and childhood²⁶. As long as these infants and children follow their trajectory, they should not be classified as undernourished. Even if only a third of the preschool children who had low BMI fall into this category, the undernutrition with wasting will be no more than 10 per cent. The fear that Indian children are wasting away inspite of high economic growth and national food security is, therefore, unwarranted. Identification of these children through screening and providing them with effective health and nutrition care would result in substantial reduction in wasting and allow them to continue to grow on their linear growth trajectory.

Summary and conclusion

In the sixties of the last century the acute or chronic food inadequacy at national, regional or household level was widespread among the poor segments of population. Taking this into account food security was defined as the ability of a country or region to assure adequate food supply for its current and projected population. Over the next three decades many countries became self sufficient in food production but calamity associated acute food scarcity and wasting persisted in some pockets. Poverty and inability to purchase adequate food leading to undernutrition and micronutrient deficiencies persist even today among the poor segments of population. The nineties witnessed the emergence of dual nutrition burden in all the countries with persistent inadequate dietary intake and undernutrition on one side and low physical activity/food intake above requirements and overnutrition on the other side.

Body size and physical activity levels are two major determinants of human nutrient requirements. The revised ICMR RDAs for Indians take cognisance

of the current body weight and physical activity of Indians while computing the energy and nutrient requirements. The revised RDA has been used to assess gap in food intake in women and children and providing food supplements to bridge the gap and prevent undernutrition.

The 1996 World Food Summit provided a comprehensive definition of food security bringing into focus the linkage between food, nutrition and health. FAO has advocated use of the following 'Food Insecurity Outcome' indicators (i) per capita food grain availability assessed at national level, (ii) access to food grain at household level as assessed by hunger rates, (iii) health as assessed by infant and under five mortality, and (iv) nutrition as assessed by under five underweight and low BMI in adults⁹.

Review of the progress towards food security in India using these indicators show that (i) in food production (self sufficient since seventies) and household access to food (low hunger rates) India has fared well, (ii) in U5MR India compares well with developing countries with similar health profile, and (iii) in underweight in under five children India fares poorly with rates comparable to that of Sub-Saharan Africa.

The persistent high underweight rates in preschool children have been a matter of serious concern for policy makers and programme implementers since it implies that inspite of relatively good performance in economic, agriculture and health sector, and substantial investment in nutrition sector, the country has lagged behind in addressing undernutrition.

Nutrition scientists have suggested that in India underweight in under five children may not be a good indicator for assessment of food insecurity because third of Indian infants are born with low birth weight and birth weight is a major determinant of growth in infancy and childhood. The steep rise in underweight rates occurs between 3-23 months of age and is related to poor infant and young child feeding practices which are not directly linked to household food insecurity. In India and South Asia stunting rates in preschool children are high. Stunted children with appropriate weight for their height get misclassified as underweight.

Available data from India indicate that only about 1/6th Indian preschool children have low BMI for age. If normal BMI is used as the criterion for nutrition security, India fares well with over 80 per cent of

preschool children and 60 per cent adults in India being normally nourished. As both under- and overnutrition are associated with health hazards, perhaps time has come for use of normal BMI as the nutrition indicator for food security.

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